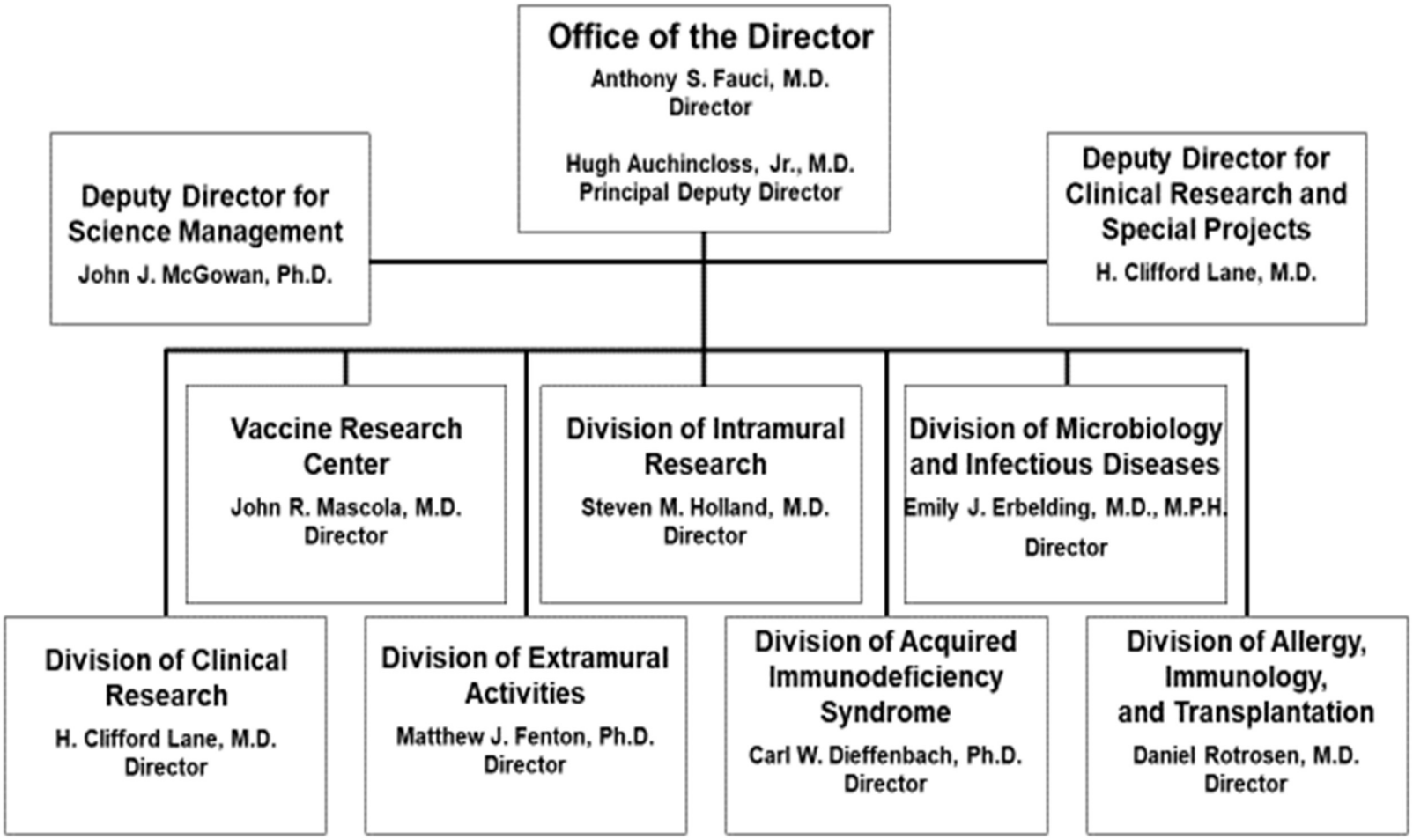
DEPARTMENT OF HEALTH AND HUMAN SERVICES

NATIONAL INSTITUTES OF HEALTH

National Institute of Allergy and Infectious Diseases (NIAID)

National Institute of Health
National Institute of Allergy and Infectious Diseases
Organizational Structure



NATIONAL INSTITUTES OF HEALTH

National Institute of Allergy and Infectious Diseases

For carrying out section 301 and title IV of the PHS Act with respect to allergy and infectious diseases, [$5,885,470,000]*$5,445,886,000*.

NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Amounts Available for Obligation[1]
(Dollars in Thousands)

Source of Funding	FY 2019 Final	FY 2020 Enacted	FY 2021 President's Budget
Appropriation	$5,523,324	$5,885,470	$5,445,886
Mandatory Appropriation: (non-add)			
Type 1 Diabetes	*(0)*	*(0)*	*(0)*
Other Mandatory financing	*(0)*	*(0)*	*(0)*
Rescission	0	0	0
Sequestration	0	0	0
Secretary's Transfer	-18,972	0	0
Subtotal, adjusted appropriation	$5,504,352	$5,885,470	$5,445,886
OAR HIV/AIDS Transfers	35,783	-9,275	0
HEAL Transfer from NINDS	5,000	0	0
Subtotal, adjusted budget authority	$5,545,135	$5,876,195	$5,445,886
Unobligated balance, start of year	7,109	0	0
Unobligated balance, end of year	0	0	0
Subtotal, adjusted budget authority	$5,552,244	$5,876,195	$5,445,886
Unobligated balance lapsing	-14	0	0
Total obligations	$5,552,230	$5,876,195	$5,445,886

[1] Excludes the following amounts (in thousands) for reimbursable activities carried out by this account:
FY 2019 - $19,521 FY 2020 - $21,470 FY 2021 - $22,543

NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Budget Mechanism - Total[1]

(Dollars in Thousands)

MECHANISM	FY 2019 Final		FY 2020 Enacted		FY 2021 President's Budget		FY 2021 +/- FY 2020 Enacted	
	No.	Amount	No.	Amount	No.	Amount	No.	Amount
Research Projects:								
Noncompeting	3,364	$2,356,701	3,691	$2,526,746	3,740	$2,166,480	49	-$360,266
Administrative Supplements	*(47)*	6,239	*(47)*	7,080	*(26)*	2,800	*(-21)*	-4,281
Competing:								
Renewal	151	115,054	158	121,603	128	125,972	-30	4,369
New	1,278	677,761	1,350	698,209	1,081	823,637	-269	125,428
Supplements	8	4,013	10	4,934	6	3,977	-4	-957
Subtotal, Competing	1,437	$796,828	1,518	$824,746	1,215	$953,586	-303	$128,840
Subtotal, RPGs	4,801	$3,159,767	5,209	$3,358,572	4,955	$3,122,866	-254	-$235,706
SBIR/STTR	255	135,260	297	156,610	287	148,643	-10	-7,966
Research Project Grants	5,056	$3,295,027	5,506	$3,515,182	5,242	$3,271,509	-264	-$243,673
Research Centers:								
Specialized/Comprehensive	26	$63,880	27	$69,974	27	$67,857	0	-$2,117
Clinical Research	0	948	0	967	0	900	0	-67
Biotechnology	0	0	0	0	0	0	0	0
Comparative Medicine	0	500	0	306	0	285	0	-21
Research Centers in Minority Institutions	0	0	0	0	0	0	0	0
Research Centers	26	$65,328	27	$71,247	27	$69,042	0	-$2,205
Other Research:								
Research Careers	292	$49,229	308	$52,234	292	$48,450	-16	-$3,784
Cancer Education	0	0	0	0	0	0	0	0
Cooperative Clinical Research	0	0	0	0	0	0	0	0
Biomedical Research Support	0	0	0	0	0	0	0	0
Minority Biomedical Research Support	0	401	0	409	0	381	0	-28
Other	104	29,791	110	31,072	103	28,749	-7	-2,323
Other Research	396	$79,421	418	$83,715	395	$77,579	-23	-$6,136
Total Research Grants	5,478	$3,439,776	5,951	$3,670,144	5,664	$3,418,131	-287	-$252,013
Ruth L Kirchstein Training Awards:	FTTPs		FTTPs		FTTPs		FTTPs	
Individual Awards	246	$11,049	256	$11,773	238	$10,934	-18	-$839
Institutional Awards	873	49,174	905	52,200	843	48,503	-62	-3,697
Total Research Training	1,119	$60,223	1,161	$63,973	1,081	$59,437	-80	-$4,536
Research & Develop. Contracts	232	$980,723	233	$1,014,103	226	$911,908	-7	-$102,194
(SBIR/STTR) (non-add)	*(38)*	*(32,205)*	*(31)*	*(30,117)*	*(28)*	*(26,084)*	*(-3)*	*(-4,033)*
Intramural Research	882	715,487	901	758,327	901	705,244	0	-53,083
Res. Management & Support	1,039	348,926	1,062	369,649	1,062	351,166	0	-18,482
Res. Management & Support (SBIR Admin) (non-add)	*(0)*	*(195)*	*(0)*	*(2,598)*	*(0)*	*(1,000)*	*(0)*	*(-1,598)*
Construction		0		0		0		0
Buildings and Facilities		0		0		0		0
Total, NIAID	1,921	$5,545,135	1,963	$5,876,195	1,963	$5,445,886	0	-$430,309

[1] All items in italics and brackets are non-add entries.

Major Changes in the Fiscal Year 2021 President's Budget Request

Major changes by budget mechanism and/or budget detail are briefly described below. The FY 2021 President's Budget for NIAID is $5,445.9 million, a decrease of $430.3 million from the FY 2020 Enacted level. Overall reductions of 7.3 percent are distributed across all programmatic areas including basic, translational and clinical research. NIAID is committed to aligning support for these key priorities along with the rest of the Institute's research portfolio. Within that framework of the Administration's fiscal policy goals for the Federal Government, NIAID will pursue its highest research priorities through strategic investments and careful stewardship of appropriated funds.

Research Project Grants (RPGs) (-$243.7 million; total $3,271.5 million):
NIAID will reduce FY 2021 existing noncompeting RPGs commitments by 7.0 percent. Compared to the FY 2020 Enacted level, this represents a decrease of 14.3 percent or $360.3 million. Funding for competing RPGs is expected to increase by 15.6 percent or $128.8 million compared to the FY 2020 Enacted level. The larger than expected increase is largely due to the re-competition of NIAID's HIV/AIDS Clinical Trials Networks involving large-scale, multi-site clinical research activities in addition to preserving the Institute's investment in combating antibiotic resistant bacteria (CARB) and universal influenza vaccine (UIV) research. The number of competing grant awards will decrease due to reductions in investigator-initiated awards and programmatic cuts to competing awards. Overall, RPG funding will decrease by 6.9 percent.

Other Mechanisms including Centers, Other Research, and Training (-$12.8 million; total $206.1 million):
NIAID will reduce funding by 3.1 percent for Centers, 7.3 percent for Other Research, and 7.1 percent for Training, resulting in decreases of $2.2 million, $6.1 million and $4.5 million respectively from their FY 2020 Enacted levels.

Research and Development (R&D) Contracts (-$102.2 million; total $911.9 million):
NIAID will reduce funding for R&D Contracts by 10.1 percent across all program areas.

Intramural Research (IR) (-$53.1 million; total $705.2 million):
NIAID will reduce funding for IR by 7.0 percent. IR will continue to support critical long-range priorities with funds carefully aligned to key research activities including infectious diseases, such as HIV/AIDS, malaria, CARB and influenza.

Research Management and Support (RMS) (-$18.5 million; total $351.2 million):
NIAID will reduce funding for RMS by 5.0 percent, which will reduce NIAID's overall level of program management and administrative support, consistent with the decrease in extramural research awards.

NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Summary of Changes

(Dollars in Thousands)

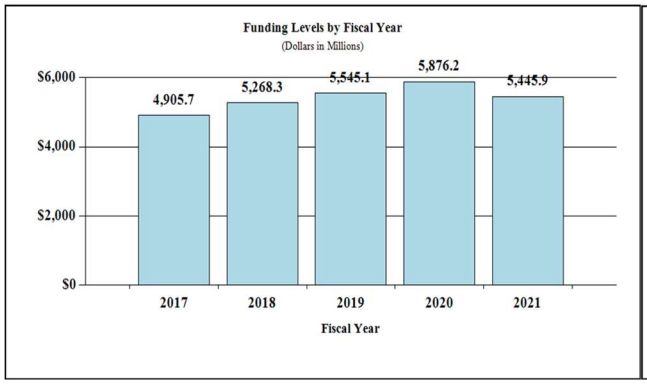
FY 2020 Enacted	$5,876,195
FY 2021 President's Budget	$5,445,886
Net change	-$430,309

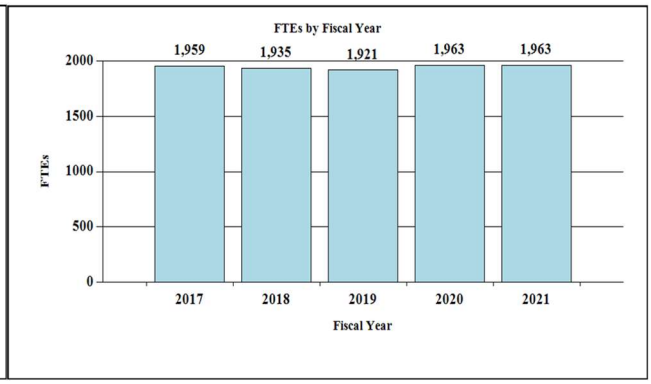
CHANGES	FY 2021 President's Budget FTEs	FY 2021 President's Budget Budget Authority	Change from FY 2020 Enacted FTEs	Change from FY 2020 Enacted Budget Authority
A. Built-in:				
1. Intramural Research:				
a. Annualization of January 2020 pay increase & benefits		$189,101		$1,224
b. January FY 2021 pay increase & benefits		189,101		2,837
c. Paid days adjustment		189,101		-706
d. Differences attributable to change in FTE		189,101		0
e. Payment for centrally furnished services		90,721		-4,775
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		425,422		5,259
Subtotal				$3,840
2. Research Management and Support:				
a. Annualization of January 2020 pay increase & benefits		$195,974		$1,255
b. January FY 2021 pay increase & benefits		195,974		3,036
c. Paid days adjustment		195,974		-731
d. Differences attributable to change in FTE		195,974		0
e. Payment for centrally furnished services		25,350		-1,334
f. Cost of laboratory supplies, materials, other expenses, and non-recurring costs		129,842		624
Subtotal				$2,850
Subtotal, Built-in				$6,689

CHANGES	FY 2021 President's Budget No.	FY 2021 President's Budget Amount	Change from FY 2020 Enacted No.	Change from FY 2020 Enacted Amount
B. Program:				
1. Research Project Grants:				
a. Noncompeting	3,740	$2,169,280	49	-$364,546
b. Competing	1,165	953,586	-353	128,840
c. SBIR/STTR	287	148,643	-10	-7,966
Subtotal, RPGs	5,192	$3,271,509	-314	-$243,673
2. Research Centers	27	$69,042	0	-$2,205
3. Other Research	395	77,579	-23	-6,136
4. Research Training	1,129	59,437	-65	-4,536
5. Research and development contracts	226	911,908	-7	-102,194
Subtotal, Extramural		$4,389,475		-$358,744
	FTEs		FTEs	
6. Intramural Research	901	$705,244	0	-$56,923
7. Research Management and Support	1,062	351,166	0	-21,332
8. Construction		0		0
9. Buildings and Facilities		0		0
Subtotal, Program	1,963	$5,445,886	0	-$436,998
Total changes				-$430,309

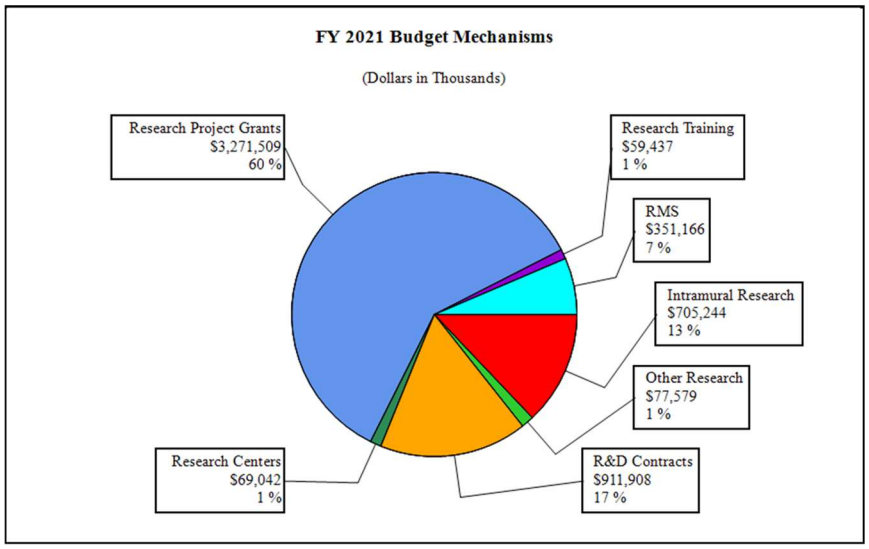
Fiscal Year 2021 Budget Graphs

History of Budget Authority and FTEs:

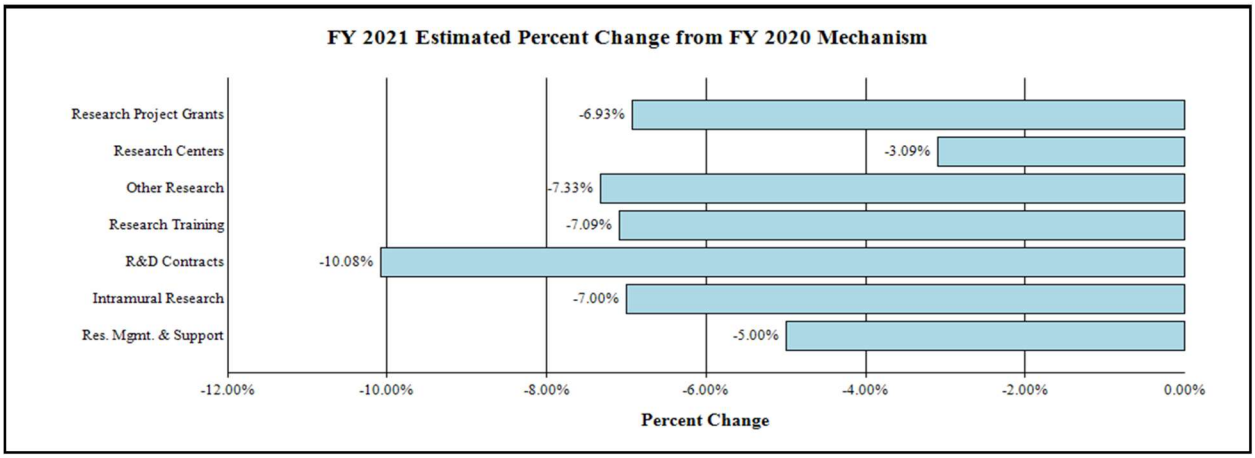




Distribution by Mechanism:



Change by Selected Mechanisms:



NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Budget Authority by Activity[1]

(Dollars in Thousands)

	FY 2019 Final		FY 2020 Enacted		FY 2021 President's Budget		FY 2021 +/- FY2020	
Extramural Research	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**	**FTE**	**Amount**
Detail								
HIV/AIDS [2]		$1,403,802		$1,423,774		$1,299,561		-$124,213
Biodefense & Emerging Infectious Diseases [3]		1,798,987		1,928,912		1,793,002		-135,911
Infectious & Immunological Diseases		1,272,934		1,395,533		1,296,913		-98,620
Subtotal, Extramural		**$4,480,722**		**$4,748,219**		**$4,389,475**		**-$358,744**
Intramural Research	**882**	**$715,487**	**901**	**$758,327**	**901**	**$705,244**	**0**	**-$53,083**
Research Management & Support	**1,039**	**$348,926**	**1,062**	**$369,649**	**1,062**	**$351,166**	**0**	**-$18,482**
TOTAL	**1,921**	**$5,545,135**	**1,963**	**$5,876,195**	**1,963**	**$5,445,886**	**0**	**-$430,309**

[1] Includes FTEs whose payroll obligations are supported by the NIH Common Fund.

[2] Reflects NIAID extramural total for HIV/AIDS. NIAID-wide totals are (in thousands) $1,743,221 in FY 2019; $1,779,113 in FY 2020; and $1,632,583 in FY 2021.

[3] Reflects NIAID extramural total for Biodefense. NIAID-wide totals are (in thousands) $2,204,342 in FY 2019; $2,371,416 in FY 2020; and $2,207,162 in FY 2021.

NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Authorizing Legislation

	PHS Act/ Other Citation	U.S. Code Citation	2020 Amount Authorized	FY 2020 Enacted	2021 Amount Authorized	FY 2021 President's Budget
Research and Investigation	Section 301	42§241	Indefinite	$5,876,195,000	Indefinite	$5,445,886,000
National Institute of Allergy and Infectious Diseases	Section 401(a)	42§281	Indefinite		Indefinite	
Total, Budget Authority				$5,876,195,000		$5,445,886,000

NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Appropriations History

Fiscal Year	Budget Estimate to Congress	House Allowance	Senate Allowance	Appropriation
2012	$4,915,970,000	$4,915,970,000	$4,725,288,000	$4,499,215,000
Rescission				$8,503,516
2013	$4,495,307,000		$4,508,932,000	$4,490,711,484
Rescission				$8,981,423
Sequestration				($225,402,837)
2014	$4,578,813,000		$4,548,383,000	$4,358,841,000
Rescission				$0
2015	$4,423,357,000			$4,358,841,000
Rescission				$0
2016	$4,614,779,000	$4,512,918,000	$4,710,342,000	$4,629,928,000
Rescission				$0
2017[1]	$4,715,697,000	$4,738,883,000	$4,961,305,000	$4,906,638,000
Rescission				$0
2018	$3,782,670,000	$5,005,813,000	$5,127,866,000	$5,260,210,000
Rescission				$0
2019	$4,761,948,000	$5,368,029,000	$5,506,190,000	$5,523,324,000
Rescission				$0
2020	$4,754,379,000	$5,811,268,000	$5,937,816,000	$5,885,470,000
Rescission				$0
2021	$5,445,886,000			

[1] Budget Estimate to Congress includes mandatory financing.

Justification of Budget Request

National Institute of Allergy and Infectious Diseases

Authorizing Legislation: Section 301 and title IV of the Public Health Service Act, as amended.

Budget Authority (BA):

	FY 2019 Final	FY 2020 Enacted	FY 2021 President's Budget	FY 2021 + / - FY 2020
BA	$5,545,135,000	$5,876,195,000	$5,445,886,000	-$430,309,000
FTE	1,921	1,963	1,963	0

Program funds are allocated as follows: Competitive Grants/Cooperative Agreements; Contracts; Direct Federal/Intramural and Other.

Director's Overview

The National Institute of Allergy and Infectious Diseases (NIAID) conducts and supports basic and applied research to better understand, treat, and ultimately prevent infectious, immunologic, and allergic diseases. Through its comprehensive basic research portfolio, NIAID continues to expand the understanding of pathogen biology and host immune responses to microbes, and of normal immune system function and the immune dysfunctions that underlie allergy, asthma, autoimmune disease, and transplant rejection. With NIAID support, scientists also design, develop, and test new diagnostics, treatments, and vaccines that can be deployed to protect and treat people worldwide.

Since AIDS was first described in 1981, an increasingly robust and sustained NIAID research effort has transformed the lives of people living with HIV. Lifesaving antiretroviral therapy (ART) has led to marked reductions in deaths and illness due to HIV and its associated coinfections, comorbidities, and other complications. Whereas the average life expectancy following an AIDS diagnosis in the 1980s was approximately one year, today, with combination antiretroviral drug treatments started early in the course of HIV infection, a person in their twenties newly diagnosed with HIV can expect a near-normal lifespan. In recent years, landmark studies supported by NIAID have shown that ART can be a powerful tool in preventing HIV transmission. Specifically, when HIV is suppressed with ART to undetectable levels in a person with HIV, the virus cannot be transmitted to that person's uninfected sexual partner. Other studies have shown that pre-exposure prophylaxis (PrEP) with a single pill containing two antiretroviral drugs, taken once a day, can protect people at risk from acquiring HIV.

Building on these remarkable advances, an end to the HIV epidemic has become a theoretical possibility by scaling up HIV testing and diagnosis so that virtually everyone knows their HIV

status; linking all people living with HIV to care; and offering PrEP to those who are at risk for HIV acquisition. This strategy, as outlined in the HHS initiative, "Ending the HIV Epidemic (EHE): A Plan for America," begins by targeting efforts to geographic and demographic "hot spots" where most new HIV diagnoses are concentrated. The program has the goals of reducing new HIV transmissions by 75 percent over the next 5 years and by 90 percent within the next 10 years. To achieve these goals, NIAID is supporting novel research to improve the diagnosis, linkage to care, and treatment of people living with HIV and protect those at risk of HIV acquisition. In addition, NIAID recently announced supplemental grants to institutions participating in the NIH-funded Centers for AIDS Research programs. These awards will support pilot and exploratory studies aimed at enhancing the knowledge base needed for future implementation of science activities related to the EHE plan.

On September 19, 2019 the Executive Order on Modernizing Influenza Vaccines in the United States to Promote National Security and Public Health was issued. NIAID is aligned with the goals of the Executive Order and is dedicated to developing a new generation of influenza vaccines to protect against seasonal epidemics and future global pandemics. In the United States, the effectiveness of seasonal influenza vaccines, which must be updated each year, ranges from 10 percent to 60 percent. NIAID supports a broad research program to improve seasonal influenza vaccines, including through the use of adjuvants that may enhance and broaden protection against diverse influenza strains. In 2019, NIAID established the Collaborative Influenza Vaccine Innovation Centers, a multidisciplinary program to support research to improve seasonal vaccines and develop promising new influenza vaccine candidates. NIAID also initiated a cohort study in infants to examine how initial and repeated exposures to influenza viruses shape our immunity to future influenza exposures and vaccines.

Recent NIAID-supported studies have advanced progress toward the development of a "universal" influenza vaccine that could provide robust, lasting protection against multiple strains of influenza, including emerging strains that could cause a global pandemic. These advances include the discovery of a "multidomain" antibody, MD3606, that has been shown to protect mice against both influenza A and influenza B infection, providing evidence that vaccines eliciting these types of antibodies could protect against diverse influenza strains. NIAID intramural researchers also have pioneered the use of artificial nanoparticles to expose the immune system to multiple influenza proteins simultaneously. One nanoparticle vaccine approach, known as "mosaic" vaccines, incorporates viral components from multiple influenza strains into miniscule particles, which may induce a more effective immune response than current vaccines. Researchers found that immunizing mice with an influenza nanoparticle vaccine candidate resulted in improved neutralizing capacity against various influenza strains spanning the past 90 years compared to immunization with a single influenza protein. One of the challenges in developing a universal vaccine is that portions of the virus surface protein, hemagglutinin (HA) constantly change. This change is the reason seasonal flu vaccines need to be updated each year. To overcome this challenge, researchers are investigating influenza vaccine candidates designed to target areas of the HA protein that change less frequently. In 2019, researchers launched a clinical trial of a prototype of one such vaccine that was developed by NIAID scientists. The trial will examine the candidate vaccine's safety and tolerability as well as its ability to induce an immune response in healthy volunteers. It is a promising step forward in the effort to develop a durable and broadly protective universal influenza vaccine.

Many infectious diseases are rare in the United States because of mass childhood vaccination programs. However, these diseases are still found in other parts of the world and can be reintroduced to the United States by travelers and spread within communities among people who have not been vaccinated. The recent resurgence of measles, a highly contagious and potentially deadly disease that had been declared eliminated in the United States in 2000, is a reminder of the need for high rates of vaccination coverage. NIAID support of research to better understand vaccine safety will help inform the public about the benefits of vaccination and contribute to the development of next-generation vaccines to improve public health and protect children and other vulnerable populations.

Respiratory syncytial virus (RSV) is a huge public health burden, particularly among children, and no approved vaccine exists for this serious pathogen. Each year, an estimated 57,000 children under the age of five years are hospitalized in the United States due to RSV infection.[1] In addition, RSV infection in early life can predispose children to wheezing and chronic asthma. NIAID is advancing several clinical trials of promising intranasal RSV vaccine candidates. The intramural research program (IRP) is conducting early-phase clinical trials to compare promising vaccine candidates head to head—a powerful trial design that allows for rapid improvement in vaccine characteristics, therefore more efficiently producing an optimized candidate to bring forward to advanced development. Another RSV vaccine candidate, SeVRSV, has been tested for safety and the ability to stimulate an immune response in the NIAID Vaccine and Treatment Evaluation Units. The SeVRSV vaccine was developed using a modified mouse virus that has been safe and effective in clinical trials of vaccines for other infectious diseases, including HIV. NIAID also is supporting the use of novel strategies to develop effective vaccine candidates against RSV. An RSV vaccine candidate, DS-Cav1, which was engineered and developed by researchers at NIAID, has shown early promise, prompting large increases in RSV-neutralizing antibodies that were sustained for several months in healthy volunteers. Recently, NIAID-supported researchers used a novel nanoparticle vaccine that enhanced immune responses to RSV in nonhuman primates compared with similar vaccination strategies that did not include the nanoparticle. These results suggest that nanoparticle technology could be used to enhance vaccines against RSV, and potentially used for developing enhanced vaccines for other infectious diseases. Another powerful tool is the IRP's model for experimental infection of adult volunteers with RSV. This controlled human infection model is expected to yield important data on adult RSV vaccine and antiviral drug candidate effectiveness. Researchers hope that the model will also serve as a safe and valuable means to investigate RSV infection and immune responses to the virus.

NIAID also continues to be at the forefront of food allergy treatment and prevention research. Building on the Learning Early About Peanut (LEAP) study, which changed clinical practice guidelines for preventing peanut allergy, NIAID has expanded its clinical research capacity to improve diagnosis and speed the development of prevention and treatment strategies for other food allergies. One such treatment approach is oral immunotherapy (OIT)—the repeated exposure to small, increasing amounts of an allergen in a controlled setting to desensitize the individual. In July 2019, promising results of a small study suggested that the injectable antibody drug omalizumab substantially improved the efficacy of OIT for children with multiple food allergies. NIAID then launched the Omalizumab as Monotherapy and as Adjunct Therapy

[1] Respiratory Syncytial Virus (RSV): Trends and Surveillance. Centers for Disease Control. www.cdc.gov/rsv/research/us-surveillance.html

to Multi-Allergen Oral Immunotherapy in Food Allergic Children and Adults, or OUtMATCH, study. This large, multicenter Phase 3 study is testing the ability of omalizumab—alone or in conjunction with OIT—to increase a person's tolerance to multiple foods to which they are allergic (see also the Infectious and Immunologic Diseases *Program Portrait*).

Overall Budget Policy:
The FY 2021 President's Budget request is $5,445.9 million, a decrease of $430.3 million or 7.3 percent compared with the FY 2020 Enacted level. Within the President's Budget request, noncompeting RPG grant awards will be reduced by 7.0 percent from their FY 2021 commitment base. Average cost for competing RPGs will be reduced by 7.0 percent excluding large cohort grants. Overall, RPGs will be reduced by 6.9 percent. The average cost for R&D contracts awards will be reduced by 7.3 percent from the FY 2020 Enacted level.

In FY 2021, NIAID will support opportunities for new researchers to receive funding equivalent to those of established investigators submitting new R01 applications. NIAID will continue to support basic and applied research to prevent, diagnose, and treat infectious and immune-mediated illnesses, including illness from emerging infectious diseases, agents with bioterrorism potential, HIV/AIDS, influenza, Ebola, tuberculosis, malaria, autoimmune disorders, drug-resistant microbes, asthma, and allergies. Support for research into influenza and universal flu vaccine development in FY 2021 will be maintained at no less than FY 2020 levels, while research into Lyme disease and other tick-borne diseases will increase by $44 million from FY 2020.

The NIAID's Intramural Research and Research Management and Support programs reflect a modest increase for pay and benefits and reductions in the non-pay categories consistent with NIH budget policy.

Program Descriptions and Accomplishments

HIV/AIDS

HIV remains a major global public health crisis. In the United States, the annual number of new HIV diagnoses has remained stable, at about 39,000, from 2012 to 2017, and in 2016, 15,807 deaths occurred among people with diagnosed HIV.[2] Worldwide an estimated 1.7 million people were newly infected with HIV in 2018, and 770,000 died of HIV/AIDS.[3] As the leading U.S. government institute for biomedical HIV/AIDS research, NIAID is committed to supporting research that can prevent new transmission; reduce HIV-related deaths, HIV-associated coinfections, comorbidities, and other complications; and discover a cure. With NIAID support, researchers are advancing basic research and developing new and better treatment and prevention approaches that are critical for combating the ongoing HIV/AIDS pandemic.

Along with efforts to develop a safe and durable vaccine, which remains a key component of efforts to end the HIV pandemic, NIAID has championed transformative developments in long-acting HIV therapies. ART regimens resulting in sustained viral suppression below detectable

[2] HIV in the United States: At a Glance, updated Aug. 14, 2019. Centers for Disease Control. www.cdc.gov/hiv/statistics/overview/ataglance.html
[3] Global HIV& AIDS statistics – 2019 fact sheet. UNAIDS. www.unaids.org/en/resources/fact-sheet

levels have led to reduced HIV-related deaths and illnesses and a near-normal life expectancy for many people living with HIV. However, most existing anti-HIV drugs need to be taken daily, making optimal adherence difficult. To address this challenge, NIAID is supporting research to develop longer-acting agents for HIV treatment and prevention that would need to be taken only once a week, once a month, or even less often. Two injectable anti-HIV drugs, cabotegravir and rilpivirine, hold promise as long-acting alternatives to current ART options. A recently completed early-phase clinical trial found that cabotegravir was generally well tolerated by men and women without HIV in diverse geographical locations. The clinical trial known as Long-Acting Therapy to Improve Treatment Success in Daily Life, or LATITUDE, launched in May 2019, will help determine whether a combination of cabotegravir and rilpivirine, given by intramuscular injection once every 4 weeks, is better than conventional oral ART in managing HIV infection in people for whom adhering to conventional daily oral ART has been a challenge. Providing longer-lasting protection with reduced treatment frequency would be a critical advance in the fight against the HIV pandemic. To accelerate this process, NIAID plans to fund research projects involving collaborative academic–industry research partnerships to develop long-acting drug delivery systems for improved, simplified treatment of HIV infection in children.

In addition to advancing ART, NIAID is exploring therapies that would suppress the amount of HIV to levels where a person would no longer need treatment. NIAID is pursuing two paths toward this goal: total eradication of HIV from the body, classically referred to as a "cure," and non-ART sustained virologic remission, which would control HIV replication but not eradicate the virus. The major barrier to achieving a classic HIV cure is the persistence of an HIV reservoir—pockets of virus that lie dormant in a small number of cells in the body. To support research on attaining a classic cure, scientists recently developed a new test to accurately and easily measure the size of the HIV reservoir in an individual. The test will enable researchers to determine whether strategies to eliminate the HIV reservoir are effective. In addition to a classic HIV cure, scientists are exploring multiple strategies to achieve sustained virologic remission. These include therapeutic vaccines and infusion of broadly neutralizing anti-HIV antibodies (bNAbs), particularly combinations of bNAbs. Some of these strategies have the potential to replace daily ART with an intermittent or continual non-ART intervention, while others seek to induce permanent immune-mediated control of HIV without further intervention. To address major obstacles to achieving an HIV cure or sustained virologic remission, NIAID will solicit proposals in 2021 for four to six high-risk, high-reward HIV cure programs involving research partnerships between multiple academic institutions, industry, government, and community-based organizations, as well as for an additional collaborative program to support HIV cure research in pediatric populations.

The transformation of HIV infection to a chronic disease puts people living with HIV at risk for developing end-stage organ failure, both as a result of HIV infection and its treatment and as a result of coinfection with hepatitis B and C viruses. Making organ transplantation available to people living with HIV has been an important focus for NIAID. NIAID-sponsored studies initially established the benefits of organ transplantation in people living with HIV and led to the passage of the HIV Organ Policy Equity (HOPE) Act. Building on this research, studies on the transplantation of organs from donors with HIV into recipients with HIV and end-stage kidney and/or liver disease are underway.

Budget Policy:
The FY 2021 President's Budget request for the extramural component of the HIV/AIDS research is $1,299.6 million, a decrease of $124.2 million or 8.7 percent compared with the FY 2020 Enacted level. NIAID will continue to support research from basic discovery through clinical trials on vaccine candidates as well as other prevention strategies. NIAID is working to better understand HIV and how it causes disease, find new tools to prevent HIV infection including a preventive vaccine, develop new and more effective treatments for people living with HIV with the ultimate goal of creating an "AIDS-Free Generation." The request includes an increase of $10.0 million, for a total of $16.0 million, for the extramural Centers for AIDS Research to support the role of those centers in the HHS Ending the HIV Epidemic initiative described earlier in this narrative. NIAID is committed to supporting these key priorities along with the rest of the Institute's research portfolio.

Program Portrait: New Directions in HIV Prevention and Treatment

The last two decades of HIV research have led to advances in treatment as prevention, pre-exposure prophylaxis (PrEP), and other strategies that have shifted the paradigm for preventing and treating HIV. In the last few years, an overwhelming body of clinical evidence has firmly established the HIV Undetectable = Untransmittable concept, or U=U: People with HIV who achieve and maintain an undetectable viral load—the amount of HIV in the blood—by taking antiretroviral therapy (ART) daily do not sexually transmit the virus to others. Thus, effectively treating the infected individual is a powerful way to stop the spread of HIV. Through its intramural and extramural research programs, NIAID is pursuing multiple strategies to build on this progress, including the following:

The antiretroviral Truvada, a single pill containing two anti-HIV drugs, is also used as PrEP to protect uninfected individuals at risk of HIV acquisition. However, the daily pill regimen can be challenging for some people. As an easier and more discreet alternative, scientists are testing the effectiveness of a long-acting injectable form of protection, the new antiviral drug cabotegravir, for both men and women.

Another area of investigation is the potential use of broadly neutralizing anti-HIV antibodies (bNAbs). These antibodies can prevent multiple strains of the virus from infecting human cells and could be used directly to prevent or treat HIV. The bNAb VRC01, developed at NIAID, is being tested as a new form of prevention that involves directly infusing antibodies instead of creating a vaccine that will induce the production of such antibodies. Another antibody developed to recognize three different regions of the virus, is being tested as a potential HIV treatment. Other powerful bNAbs may be even more effective. A more recently identified bNAb known as N6 neutralized 98 percent of all HIV strains that researchers tested.

Ideally, an effective HIV vaccine could dramatically reduce the spread of HIV around the world. NIAID is supporting three large efficacy trials testing two different preventive vaccine regimens. The HVTN 702 trial is testing an improved version of the vaccine regimen assessed in the RV144 Thai trial—the only candidate HIV vaccine regimen ever shown to provide some measure of protection against the virus. The HVTN 705/Imbokodo and HVTN 706/Mosaico trials are testing different vaccine regimens that are specifically designed to induce immune responses against a variety of global HIV strains.

Biodefense and Emerging Infectious Diseases
NIAID has a dual mandate to conduct basic and applied research in infectious and immune-mediated diseases as well as respond rapidly to emerging and re-emerging disease threats. In this regard, NIAID has accelerated research to better understand the unexpected rise in cases of acute flaccid myelitis (AFM), a disease marked by muscle weakness and paralysis that mostly affects young children. Although the specific cause or causes of AFM remain unclear, AFM outbreaks have arisen every other year since 2014 and have sometimes occurred at the same time and location as infections with enterovirus-D68 (EV-D68) and another enterovirus, EV-A71, which are related to poliovirus. NIAID continues to support efforts to define the causes of AFM

and develop measures to combat this debilitating disease. Recently, NIAID-funded researchers developed a microchip test, AFM-SeroChip-1, that detected antibodies against EV-D68 and other enteroviruses in about 80 percent of screened patients with AFM. The presence of these antibodies strengthens the link between enterovirus infection and the development of AFM. Building on these and other findings, NIAID is supporting development of an inactivated whole-virus EV-D68 vaccine candidate and testing antibodies and small molecules to combat enteroviruses. In addition to these more targeted approaches, NIAID also is supporting a multinational natural history study in young children to better understand the causes and clinical manifestations of AFM.

Reported cases of tick-borne diseases (TBDs) more than doubled in the United States from 2004 to 2016. Depending on the disease, clinical manifestations of TBDs can range from mild, self-limiting infections to serious illness, extended disability, or even death. NIAID supports a broad range of basic research on Lyme disease and other TBDs, including cutting-edge research on the complex interplay of human hosts, pathogens, ticks, and animal reservoirs. Recent advances include a study that identified a unique cellular component of *Borrelia burgdorferi*, the bacteria that causes Lyme disease. This finding may lead to improved diagnostics and treatment options for people with Lyme disease. While diagnostic tests exist for TBDs, new tests are needed that are rapid and easy to interpret while maintaining high specificity. NIAID has prioritized the advancement of new technologies for diagnosing TBDs. These include the recently developed TBD Serochip, which can diagnose up to eight different TBDs from a single blood sample, and a rapid point-of-care diagnostic test for Lyme disease that recently received FDA approval. For some TBDs, notably Lyme disease, some individuals report continuing, sometimes debilitating, symptoms following standard treatment or when the infection has not been diagnosed and treated promptly. NIAID is investigating potential causes of persistent symptoms that may occur after treatment of Lyme disease. NIAID researchers are recruiting subjects for a clinical study that aims to use uninfected ticks to detect *B. burgdorferi* in patients who have been treated with antibiotics. These efforts are part of the comprehensive NIH research strategy against TBDs, as recently outlined in the *NIH Strategic Plan for Tickborne Disease Research*.[4]

Most bacteria, viruses, and other microbes multiply rapidly and can evolve and develop resistance to antimicrobial drugs. Overuse or misuse of antibiotics can cause resistance to develop more quickly, and drug resistance is making many diseases increasingly difficult—and sometimes impossible—to treat. To address the growing global public health threat of antimicrobial resistance (AMR), NIAID is collaborating with government and non-government groups around the world. The NIAID-funded Antibacterial Resistance Leadership Group (ARLG) has initiated more than 40 clinical studies at 130 sites to address key clinical research questions in antibiotic resistance. NIAID, the Assistant Secretary for Preparedness and Response (ASPR) and the Biomedical Advanced Research and Development Authority (BARDA) are supporting the public-private Combating Antibiotic Resistant Bacteria Accelerator (CARB-X) program that is further advancing the development of diagnostics, treatments, and vaccines to counter AMR. NIAID also supports a comprehensive research portfolio of basic and applied research to identify and test novel approaches to combat antibiotic-resistant bacteria. Researchers recently identified how a surface component of gram-negative bacteria, which are among the most serious antimicrobial-resistant health threats, is trafficked from inside the cell to

[4] www.niaid.nih.gov/sites/default/files/NIH-Strategic-Plan-Tickborne-Disease-Research-2019.pdf

the surface, thus providing possible new targets for drug design. To further advance promising research findings, NIAID is supporting clinical trials to test treatments against antibiotic-resistant bacteria. A Phase 2 clinical trial of the investigational antibiotic zoliflodacin demonstrated its effectiveness against uncomplicated gonorrhea, which has progressively developed resistance to each of the antibiotics used to treat it. Zoliflodacin now is undergoing further testing against gonorrhea in a large, multicenter Phase 3 clinical trial sponsored by the Global Antibiotic Research and Development Partnership. NIAID also is supporting an international clinical trial to compare the effectiveness of colistin alone or in combination with another antibiotic, carbapenem, to treat gram-negative bacterial infections. The findings from these studies will help improve antibiotic treatment options against bacterial infections.

Among the growing global health threats is the emergence of multidrug-resistant tuberculosis (MDR-TB), an infection resistant to the two most effective anti-TB drugs, rifampin and isoniazid, and extensively drug-resistant TB (XDR-TB), which is resistant to many additional TB drugs. To combat this threat, several antimicrobial drugs are being assessed, including the TB drug delamanid, which is being tested in a new, large NIAID-supported trial for people exposed to MDR-TB. The trial is comparing the safety and efficacy of delamanid with that of the decades-old TB drug isoniazid for preventing active MDR-TB disease in people at high risk who are exposed to adult household members with MDR-TB. NIAID played an important role in developing the new TB drug pretomanid, recently approved by the FDA as part of a three-drug oral treatment regimen for XDR-TB. NIAID is now evaluating the safety of pretomanid for patients with kidney or liver impairment. In 2018, the publication of the *NIAID Strategic Plan for Tuberculosis Research*[5] outlined the Institute's comprehensive approach and scientific priorities for combating TB, including the growing threat of MDR-TB and XDR-TB.

Preparedness for major infectious disease outbreaks can save thousands of lives; rapid deployment of effective diagnostics, treatments, and vaccines may even stop the infectious disease from becoming a pandemic. One way that NIAID is preparing the United States for infectious disease outbreaks is through a "prototype pathogen" approach. This strategy involves studying the characteristics of categories or families of pathogens, such as the family of viruses that includes dengue, West Nile, and Zika viruses, and developing vaccines for the category ahead of time. When a disease from a specific category causes an outbreak, these vaccine development approaches could be adapted, if necessary, to the specific pathogen within that family, and researchers have a greater chance of quickly deploying an effective vaccine. To accelerate the vaccine development timeline, NIAID also is advancing various platform technologies, such as those involving nanoparticles or viral vectors, that can be used to produce multiple vaccines. Researchers recently developed a candidate DNA vaccine for Zika virus with the same platform used previously for a vaccine for West Nile virus, a related flavivirus.

NIAID also supports ecological and clinical research capacity in strategic international locations to translate investments in research preparedness into a real impact that mitigates infectious disease outbreaks. A recent collaboration between the IRP, international groups, and the Congolese Ministry of Health in the Republic of Congo established a low-cost wildlife mortality reporting network covering 50,000 kilometers as part of an early warning system for spillover events from wildlife to humans. Spillover events have been linked to significant human outbreaks of infectious diseases like Ebola, especially in the Congo Basin. In addition to training

[5] www.niaid.nih.gov/sites/default/files/TBStrategicPlan2018.pdf

on-site staff, diagnostics for Ebola virus testing were established, reducing diagnostic turnaround time to 3 days in the Republic of the Congo. These projects are part of a long-term effort, with multiple pillars, to improve Ebola virus preparedness (see also *Program Portrait*).

Budget Policy:
The FY 2021 President's Budget request for the extramural component of biodefense and emerging infectious diseases research supported by NIAID is $1,793.0 million, a decrease of $135.9 million or 7.1 percent compared with the FY 2020 Enacted level. NIAID will continue to promote basic and clinical research aimed at the development of vaccines, therapeutics and diagnostics for emerging and re-emerging infectious diseases including advancing a universal influenza vaccine and therapeutics against emerging infectious diseases and antibiotic resistant bacteria. A top NIAID priority is to support research leading to better therapeutics and vaccines for influenza including the development of a broadly cross-protective or universal vaccine that protects against pandemic and seasonal influenza strains over several years. NIAID supports the development of medical countermeasures and new platform technologies against biodefense and emerging infectious disease pathogens and will continue to coordinate with BARDA in the advanced development of therapeutics and vaccines. Along with maintaining research funding for research into Lyme disease and other tick-borne diseases, the FY 2021 request includes an increase of $44 million to support the Strategic Plan for Tick-Borne Disease Research. NIAID is committed to supporting these key priorities along with the rest of the Institute's research portfolio.

Program Portrait: Ebola Clinical Research as a Model for Responding to Emerging Infectious Diseases

When the largest Ebola virus disease (EVD) outbreak in history occurred in West Africa from 2014 to 2016, NIAID rapidly launched a robust research response. A critical component of this response was an agreement between the Department of Health and Human Services and the government of Liberia to foster collaboration on relevant research initiatives, which culminated in Partnership for Research on Ebola Virus in Liberia (PREVAIL). Under the PREVAIL umbrella, NIAID and West African researchers collaborated to study candidate vaccines and therapeutics during the outbreak. These NIAID-supported EVD studies showed the feasibility of conducting scientifically and ethically sound clinical research during a major public health emergency. NIAID incorporated the lessons learned in conducting research during the West African outbreak into its response to the recent re-emergence of EVD in the Democratic Republic of the Congo (DRC). The Ebola outbreak is occurring in an area of armed conflict and tenuous security, hindering response efforts. Despite these challenges, in November 2018, the NIAID-supported Pamoja Tulinde Maisha (PALM, Kiswahili for "Together Save Lives") clinical trial was launched, evaluating four investigational agents (ZMapp, remdesivir, REGN-EB3, and mAb114) for the treatment of patients with EVD. Preliminary results from 499 study participants indicated that individuals with EVD receiving REGN-EB3 or mAb114 had a greater chance of survival. As a result, the study was stopped early, and all additional patients were randomly assigned to receive REGN-EB3 or mAb114. The successful execution of this trial during an ongoing outbreak was an enormous accomplishment in the Ebola response, providing evidence of promising therapeutics to treat the disease, as well as a potential guide for future clinical trials in outbreak settings.

Infectious and Immunologic Diseases

NIAID leads and supports basic and clinical research to better understand, diagnose, treat, and prevent infectious diseases and immune-mediated disorders—many of which have far-reaching global consequences—including malaria, neglected tropical diseases, hepatitis, TB, sexually transmitted infections (STIs), fungal diseases, autoimmune diseases, asthma, and allergic diseases.

STIs pose a significant and growing public health burden. Approximately 820,000 new cases of gonorrhea and 2.9 million cases of chlamydia occur in the United States each year, primarily in people ages 15–24. To address this problem, NIAID recently established six Cooperative Research Centers focused on developing vaccines to prevent three common STIs: syphilis, gonorrhea, and chlamydia. Within five years, each center is expected to identify at least one candidate vaccine ready for testing in clinical trials. In addition to vaccines, NIAID is advancing efforts to improve STI diagnosis. Prompt, accurate diagnosis can reduce transmission, improve treatment outcomes, and prevent the spread of drug-resistant strains of microbes. A recent ARLG study showed that two diagnostic tests for gonorrhea and chlamydia can detect these STIs in the throat and rectum, indicating the tests' usefulness beyond the reproductive and urinary systems and allowing detection in other commonly infected areas. The findings informed the May 2019 FDA approval of the tests for use in sites outside the urogenital system, which should improve diagnosis and could reduce transmission of these infections.

Chronic infection with hepatitis B virus (HBV) can cause serious health problems, such as cirrhosis, liver failure, and liver cancer. Despite a highly effective preventive HBV vaccine, approximately 257 million people worldwide are chronically infected. NIAID recently led the development of a trans-NIH strategic plan to cure HBV and reduce its sizable public health burden. The strategic plan, released in fall 2019, includes strategic priorities to advance our understanding of HBV biology, develop needed tools and resources, and develop cure strategies.

NIAID also is addressing the growing health threat of fungal diseases including Valley fever (coccidioidomycosis), which is caused by breathing dust containing the fungal pathogen *Coccidioides*. Valley fever is endemic to parts of Arizona, California, Utah, New Mexico, and Texas and can cause community-acquired pneumonia (CAP). NIAID is supporting an observational clinical study to provide data on the prevalence of Valley fever among persons presenting with CAP in endemic areas, the clinical course of the disease, and the response to antifungal treatment compared to the standard of care, which may vary by treating physician and geographic region. Another observational study will identify immune defects and genetic predispositions in people with Valley fever. Results of these observational studies will help identify predictors of clinical outcomes and compare treatment strategies. NIAID also is advancing the development of rapid, sensitive, cost-effective fungal diagnostics for use in primary healthcare settings. Researchers hope that timely recognition and treatment of invasive fungal diseases will reduce the morbidity, mortality, and inappropriate antibiotic use commonly associated with them.

NIAID is the lead institute at NIH for research on immune-mediated diseases, organ transplantation, and allergic disorders, conditions that affect millions of Americans. More than 100 human autoimmune diseases are known, including multiple sclerosis (MS), scleroderma, and systemic lupus erythematosus (SLE). Within the last decade, NIAID-sponsored and other clinical trials have demonstrated that stem cell transplantation is a promising treatment strategy for some severe autoimmune disorders. NIAID is supporting several important clinical trials in this area. Results of the High-Dose Immunosuppression and Autologous Transplantation for Multiple Sclerosis (HALT-MS) pilot clinical trial of 24 patients showed that high-dose chemotherapy followed by autologous hematopoietic stem cell transplant (HSCT)—transplanting of a person's own blood-forming stem cells back into the body to reprogram the immune system—could induce sustained remission in people with active relapsing-remitting MS. A follow-up study is anticipated to launch this year. This Phase 3 study will compare outcomes of

approximately 150 patients randomly assigned to receive either HSCT or the best available medical therapies for relapsing-remitting MS, as well as comparing the cost of treatment for the two groups. Another NIAID-sponsored study is exploring the safety and efficacy of a single infusion of mesenchymal stem cells in adults with active SLE. This study, conducted through a partnership with the Lupus Foundation of America, is currently enrolling patients and will build on promising results reported from non-randomized studies.

Asthma reduces the quality of life and is a major contributing factor to missed time from school and work. Asthma attacks also can be both frightening and dangerous. NIAID is supporting basic and clinical research to develop and improve prevention and treatment strategies for childhood asthma and to identify risk factors for the disease. For example, NIAID-sponsored birth cohort studies (studies that follow a group of children from birth onward) have identified distinct states of the gut microbiome of newborns, some of which are strongly associated with asthma development years later in life. Understanding these risk factors can help identify children at high risk of asthma development for targeted preventive therapies. In other studies, investigators have identified early allergy, by age two years, as a major predictor of future asthma. The Preventing Asthma in high Risk Kids clinical trial is testing whether omalizumab, an injectable antibody drug that blocks allergic manifestations, can prevent later asthma onset in two- to three-year-old children who have such early asthma indicators.

Budget Policy:
The FY 2021 President's Budget request for the extramural component of Infectious and Immunologic Diseases (IID) research is $1,296.9 million, a decrease of $98.6 million or 7.1 percent compared with the FY 2020 Enacted level. The FY 2021 IID research plan continues to advance NIAID's long-range research priorities and is carefully aligned to support key research activities including basic and clinical research aimed at the development of countermeasures such as therapeutics, vaccines and diagnostics for emerging and re-emerging infectious diseases, including antibiotic resistant bacteria. Funding will also continue to reflect NIAID's commitment and long-term interest in fundamental immunology and support research on organ transplantation, tick borne diseases, autoimmune diseases, asthma and other allergic diseases. NIAID is committed to supporting these key priorities along with the rest of the Institute's research portfolio.

Program Portrait: Food Allergy Prevention Studies

NIAID is the lead NIH Institute conducting research on food allergy, a condition that affects approximately eight percent of children and four percent of adults in the United States. The risk of an accidental exposure or a life-threatening reaction can place a substantial burden on patients and their families. Over the past decade, NIAID has focused research efforts on basic, preclinical, and clinical research to prevent and treat food allergies. This includes a robust set of research projects to identify food allergy risk factors and develop novel treatment and prevention strategies. NIAID-funded basic and clinical research provided the foundation for industry development of a commercial peanut oral immunotherapy product that recently was recommended for licensure by an FDA advisory panel.

Identifying Risk Factors: A follow-up analysis of participants in the Learning Early About Peanut Allergy (LEAP) trial identified a strong association between the development of peanut allergy and the MALT1 gene, which regulates activation of T lymphocytes, the cells that play a role in the body's immune response. Identification of the MALT1 gene as an independent risk factor for peanut allergy provides insight into the immune pathways leading to peanut allergy, could guide future development of treatment strategies, and could lead to shorter, smaller, and lower-

cost clinical trials. Additional research will focus on identifying other predictors of allergic and immune-mediated diseases. The Systems Biology in Early Atopy study, set to begin in 2020 at 12–14 sites around the United States, will follow a large group of children for several years, starting from birth, to identify the earliest predictors of many allergic diseases such as food allergy and atopic dermatitis (an immune disorder that causes red, itchy skin). A recent NIAID-supported study identified a unique type of atopic dermatitis that is linked to food allergy, indicating that children with this type of atopic dermatitis are good candidates for food allergy prevention strategies.

Testing Interventions: Determining food allergy risk factors helps identify children who are ideal candidates for therapeutic intervention to prevent allergy onset. In 2015, results of the LEAP trial showed that early introduction of peanut significantly decreased the risk of developing peanut allergy among children at high risk by altering the immune response. Building on the concept that early allergen exposure may prevent the development of allergic disease, the Food Exposure Allergen Suppression Trial is set to begin in 2020 to test early introduction of egg and cow's milk as a prevention strategy for infants at high risk for developing food allergy. In addition, the recently launched OUtMATCH clinical trial is testing omalizumab in children and adults allergic to multiple foods, including peanut, to see if omalizumab therapy can prevent or decrease allergic reactions to multiple foods. If effective, such treatment may prevent allergic reactions to small amounts of food that are accidentally consumed, thereby mitigating the danger of life-threatening emergencies among people with multiple food allergies.

Intramural Research Program (IRP)

The IRP is at the forefront of efforts to translate basic discoveries into new tools and treatment strategies to improve public health. The program consists of three components: 1) the Division of Intramural Research (DIR), comprising more than 110 principal investigators in Maryland and at the Rocky Mountain Laboratories in Montana who lead a wide range of basic, translational, and clinical research efforts; 2) the Vaccine Research Center, which applies fundamental advances to discover and develop new and improved vaccine candidates, such as Zika virus, universal influenza, and Ebola virus vaccine candidates; and 3) the Division of Clinical Research, which plays an integral role in facilitating the efficient and effective performance of NIAID research programs, both domestically and internationally, and managing special projects as directed by the NIAID Director. The unique nature of the IRP, along with access to the NIH Clinical Center (CC) and longstanding domestic and international partnerships, allows NIAID to execute high-risk and long-term studies, conduct research on rare diseases, and rapidly respond to global public health emergencies.

The IRP performs high-risk, high-reward studies such as a recent collaboration between DIR and other researchers that tested an experimental gene therapy for infants with a rare and life-threatening immune deficiency disorder known as X-SCID, characterized by a profound deficiency of immune cells. Infants treated with the gene therapy grew normally and their immune system function improved substantially. Another project with the potential for high reward is the universal mosquito-borne disease vaccine. DIR completed a Phase 1 study of a novel universal vaccine candidate. The vaccine, shown to be safe and to stimulate an immune response in humans, targets components of mosquito saliva to prevent transmission of multiple mosquito-borne infections. An improved version of the vaccine is now being tested in a Phase 1 study. IRP scientists also are leading research on the role of the human microbiome in human immunity. They found that beneficial bacteria living on the skin interact with cells of the immune system and induce immune responses that provide antimicrobial protection and stimulate tissue repair upon injury. IRP scientists led an international effort that found beneficial *Bacillus* bacteria can help to eliminate harmful *Staphylococcus aureus bacteria,* which cause

tens of thousands of deaths worldwide each year.[6] These studies suggest novel strategies of manipulating the microbiome to prevent and treat disease.

The IRP collaborates with its NIH partners to advance groundbreaking discoveries in areas of public health concern such as AMR. NIAID leads an initiative with multiple NIH institutes and centers, including the CC, to create an integrated AMR program. NIAID also collaborates with the CC, the National Cancer Institute, and the National Heart, Lung and Blood Institute on the new Blood & Inherited Diseases Cellular Therapy Program and supports additional trans-NIH collaborations, such as the Center for Human Immunology to advance the understanding of human immunity and immune function in health and disease, and the Center for Advanced Tissue Imaging. NIAID also leverages collaborations outside NIH to advance scientific discovery, including a clinical research partnership with the Children's National Health System that will be devoted to treating and preventing allergic, immunologic, and infectious diseases in children.

Budget Policy:
The FY 2021 President's Budget request for Intramural Research is $705.2 million, a decrease of $53.1 million or 7.0 percent compared with the FY 2020 Enacted level. The FY 2021 Intramural Research plan supports critical long-range research priorities of NIAID with funding carefully aligned to support key research activities. These include the continued support for all aspects of research on infectious diseases such as AIDS, malaria, and influenza, including the causative agent, vectors and the human host. In addition, NIAID is developing countermeasures against bioterrorism through basic research and its strong clinical research component allowing key lab discoveries to be rapidly translated into methods to prevent, diagnose, or treat disease. NIAID is committed to supporting these key priorities along with the rest of the Institute's research portfolio.

Research Management and Support (RMS): RMS activities provide administrative, budgetary, logistical, and scientific support in the review, award, and monitoring of research grants, training awards, and research and development contracts. RMS activities include strategic planning, facilitation, and evaluation of Institute programs, as well as regulatory compliance, international coordination, and liaison activities with other Federal agencies, Congress, and the public.

Budget Policy:
The FY 2021 President's Budget request is $351.2 million, a decrease of $18.5 million or 5.0 percent compared with the FY 2020 Enacted level. This budget will reduce NIAID's overall level of program management and administrative support, consistent with the decrease in grant awards.

[6] Kourtis AP et al. Vital Signs: Epidemiology and recent trends in methicillin-resistant and in methicillin-susceptible Staphylococcus aureus bloodstream Infections — United States. MMWR Morb Mortal Wkly Rep 2019;68:214–219. www.cdc.gov/mmwr/volumes/68/wr/mm6809e1.htm

NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Budget Authority by Object Class[1]

(Dollars in Thousands)

		FY 2020 Enacted	FY 2021 President's Budget	FY 2021 +/- FY 2020
Total compensable workyears:				
	Full-time equivalent	1,963	1,963	0
	Full-time equivalent of overtime and holiday hours	0	0	0
	Average ES salary	$198	$199	$2
	Average GM/GS grade	12.7	12.7	0.0
	Average GM/GS salary	$119	$120	$1
	Average salary, grade established by act of July 1, 1944 (42 U.S.C. 207)	$105	$108	$3
	Average salary of ungraded positions	$158	$160	$1
	OBJECT CLASSES	**FY 2020 Enacted**	**FY 2021 President's Budget**	**FY 2021 +/- FY 2020**
	Personnel Compensation			
11.1	Full-Time Permanent	173,719	175,716	1,998
11.3	Other Than Full-Time Permanent	75,934	76,807	873
11.5	Other Personnel Compensation	8,400	8,497	97
11.7	Military Personnel	4,650	4,773	123
11.8	Special Personnel Services Payments	22,982	23,246	264
11.9	**Subtotal Personnel Compensation**	**$285,684**	**$289,039**	**$3,355**
12.1	Civilian Personnel Benefits	88,733	92,193	3,461
12.2	Military Personnel Benefits	3,743	3,842	99
13.0	Benefits to Former Personnel	0	0	0
	Subtotal Pay Costs	**$378,160**	**$385,075**	**$6,915**
21.0	Travel & Transportation of Persons	12,062	11,516	-545
22.0	Transportation of Things	1,343	1,351	8
23.1	Rental Payments to GSA	1	1	0
23.2	Rental Payments to Others	114	105	-9
23.3	Communications, Utilities & Misc. Charges	2,878	2,409	-469
24.0	Printing & Reproduction	1	1	0
25.1	Consulting Services	42,013	35,760	-6,253
25.2	Other Services	203,662	173,204	-30,458
25.3	Purchase of goods and services from government accounts	718,846	685,588	-33,258
25.4	Operation & Maintenance of Facilities	13,092	10,895	-2,196
25.5	R&D Contracts	700,342	633,976	-66,366
25.6	Medical Care	5,635	5,267	-367
25.7	Operation & Maintenance of Equipment	25,439	21,296	-4,143
25.8	Subsistence & Support of Persons	0	0	0
25.0	**Subtotal Other Contractual Services**	**$1,709,028**	**$1,565,986**	**-$143,042**
26.0	Supplies & Materials	60,866	52,972	-7,894
31.0	Equipment	31,967	27,214	-4,752
32.0	Land and Structures	0	0	0
33.0	Investments & Loans	0	0	0
41.0	Grants, Subsidies & Contributions	3,679,752	3,399,232	-280,520
42.0	Insurance Claims & Indemnities	1	1	0
43.0	Interest & Dividends	23	23	0
44.0	Refunds	0	0	0
	Subtotal Non-Pay Costs	**$5,498,035**	**$5,060,811**	**-$437,224**
	Total Budget Authority by Object Class	**$5,876,195**	**$5,445,886**	**-$430,309**

[1] Includes FTEs whose payroll obligations are supported by the NIH Common Fund.

NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Salaries and Expenses

(Dollars in Thousands)

OBJECT CLASSES	FY 2020 Enacted	FY 2021 President's Budget	FY 2021 +/- FY 2020
Personnel Compensation			
Full-Time Permanent (11.1)	$173,719	$175,716	$1,998
Other Than Full-Time Permanent (11.3)	75,934	76,807	873
Other Personnel Compensation (11.5)	8,400	8,497	97
Military Personnel (11.7)	4,650	4,773	123
Special Personnel Services Payments (11.8)	22,982	23,246	264
Subtotal Personnel Compensation (11.9)	**$285,684**	**$289,039**	**$3,355**
Civilian Personnel Benefits (12.1)	$88,733	$92,193	$3,461
Military Personnel Benefits (12.2)	3,743	3,842	99
Benefits to Former Personnel (13.0)	0	0	0
Subtotal Pay Costs	**$378,160**	**$385,075**	**$6,915**
Travel & Transportation of Persons (21.0)	$12,062	$11,516	-$545
Transportation of Things (22.0)	1,343	1,351	8
Rental Payments to Others (23.2)	114	105	-9
Communications, Utilities & Misc. Charges (23.3)	2,878	2,409	-469
Printing & Reproduction (24.0)	1	1	0
Other Contractual Services:			
Consultant Services (25.1)	42,013	35,760	-6,253
Other Services (25.2)	203,662	173,204	-30,458
Purchases from government accounts (25.3)	571,966	527,657	-44,309
Operation & Maintenance of Facilities (25.4)	13,092	10,895	-2,196
Operation & Maintenance of Equipment (25.7)	25,439	21,296	-4,143
Subsistence & Support of Persons (25.8)	0	0	0
Subtotal Other Contractual Services	**$856,172**	**$768,812**	**-$87,359**
Supplies & Materials (26.0)	$60,866	$52,972	-$7,894
Subtotal Non-Pay Costs	**$933,435**	**$837,167**	**-$96,269**
Total Administrative Costs	**$1,311,595**	**$1,222,241**	**-$89,354**

NATIONAL INSTITUTES OF HEALTH
National Institute of Allergy and Infectious Diseases

Detail of Full-Time Equivalent Employment (FTE)

OFFICE/DIVISION	FY 2019 Final			FY 2020 Enacted			FY 2021 President's Budget		
	Civilian	Military	Total	Civilian	Military	Total	Civilian	Military	Total
Division of Acquired Immunodeficiency									
Direct:	148	11	159	151	11	162	151	11	162
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	148	11	159	151	11	162	151	11	162
Division of Allergy, Immunology, and Transplantation									
Direct:	96	-	96	98	-	98	98	-	98
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	96	-	96	98	-	98	98	-	98
Division of Clinical Research									
Direct:	90	11	101	92	11	103	92	11	103
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	90	11	101	92	11	103	92	11	103
Division of Extramural Activities									
Direct:	211	-	211	216	-	216	216	-	216
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	211	-	211	216	-	216	216	-	216
Division of Intramural Research									
Direct:	664	12	676	678	12	690	678	12	690
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	664	12	676	678	12	690	678	12	690
Division of Microbiology and Infectious Diseases									
Direct:	174	9	183	178	9	187	178	9	187
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	174	9	183	178	9	187	178	9	187
Office of the Director									
Direct:	375	2	377	384	2	386	384	2	386
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	375	2	377	384	2	386	384	2	386
Vaccine Research Center									
Direct:	117	1	118	120	1	121	120	1	121
Reimbursable:	-	-	-	-	-	-	-	-	-
Total:	117	1	118	120	1	121	120	1	121
Total	1,875	46	1,921	1,917	46	1,963	1,917	46	1,963
Includes FTEs whose payroll obligations are supported by the NIH Common Fund.									
FTEs supported by funds from Cooperative Research and Development Agreements.	0	0	0	0	0	0	0	0	0

FISCAL YEAR	Average GS Grade
2017	12.5
2018	12.6
2019	12.7
2020	12.7
2021	12.7

NATIONAL INSTITUTES OF HEALTH
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Detail of Positions[1]

GRADE	FY 2019 Final	FY 2020 Enacted	FY 2021 President's Budget
Total, ES Positions	2	2	2
Total, ES Salary	384,508	395,274	398,357
GM/GS-15	191	196	196
GM/GS-14	414	426	426
GM/GS-13	365	376	376
GS-12	227	234	234
GS-11	109	112	112
GS-10	1	1	1
GS-9	58	60	60
GS-8	30	31	31
GS-7	50	51	51
GS-6	2	2	2
GS-5	5	5	5
GS-4	6	6	6
GS-3	4	4	4
GS-2	1	1	1
GS-1	1	1	1
Subtotal	1,464	1,506	1,506
Grades established by Act of July 1, 1944 (42 U.S.C. 207)			
Assistant Surgeon General	0	0	0
Director Grade	16	16	16
Senior Grade	11	11	11
Full Grade	7	7	7
Senior Assistant Grade	7	7	7
Assistant Grade	0	0	0
Subtotal	41	41	41
Ungraded	453	453	453
Total permanent positions	1,495	1,537	1,537
Total positions, end of year	1,960	2,002	2,002
Total full-time equivalent (FTE) employment, end of year	1,921	1,963	1,963
Average ES salary	192,254	197,637	199,178
Average GM/GS grade	12.7	12.7	12.7
Average GM/GS salary	116,088	119,338	120,269

[1] Includes FTEs whose payroll obligations are supported by the NIH Common Fund.